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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Hachiro Nakanishi

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EXAMINER

OCHYLSKI, RYAN M

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,497	Applicant(s) NAKANISHI ET AL.	
	Examiner RYAN OCHYLSKI	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 December 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This is in response to the Applicant's reply of December 4, 2008. No claims were cancelled, amended, or added.

Claim Objections

1. Claims 1-4 and 7 are objected to because of the following informalities:
2. Regarding Claims 1 and 2, CS₂ (Lines 6 and 11 respectively) should be fully spelled out.
3. Regarding Claims 3, 4, and 7 "wherein chemical imidation is comprising, completing by adding" is grammatically incorrect. For the purposes of examination, Claims 3, 4, and 7 are presume to read 'wherein chemical imidation is completed by adding'
4. Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

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under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1-2 and 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. ("Aromatic Polyimide Nano-spheres Prepared by Repricitation Method") in view of Lee et al. ("Solution properties of poly(amic acid)-NMP containing LiCL and their effects on membrane morphologies") as evidenced by Asao et al. (US 6,187,899).

9. Regarding Claim 1, Suzuki et al. teach a method for preparation of porous polyimide microparticles comprising

- forming polyamide acid microparticles by pouring a polymer solution prepared by dissolving polyamide acid into a poor solvent ("poured into mix solution of cyclohexane / carbondisulfide" Paragraph 2) to form a polyamide acid concentration
 - and the temperature of which is adjusted to the range of -20°C to 60°C ("temperature of poor solution at around 20°C" Paragraph 3);

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- wherein particle size of said polyamide acid microparticles is adjusted to 50 nm to 10,000 nm by controlling the temperature of said poor solvent ("PAA nano-spheres of 100nm particle size ... particle size of PAA nano-spheres changed remarkably by temperature of poor solution" Paragraph 3),
- then treating said polyamide acid microparticles by thermal imidation ("by heat imidizing it" Paragraph 1).

However, Suzuki et al. does not teach the polyamide acid (PAA) contains 0.5 to 80 weight % of alkali metal salt, that the concentration of the PAA in the poor solvent is 0.1 to 15 weight%, that the pore size of the PAA microparticles is adjusted to the range from 20 nm to 500 nm and porosity of the PAA microparticles is adjusted to the range from 0.1% to 30% by controlling a content or kind of alkali metal salt, or that the PAA microparticles undergo imidation so that the particle size distribution, pore size, and porosity of the PAA microparticles are maintained.

In analogous art pertaining to polyamide acid solution preparation, Lee et al. teach that polyamide acid contains 0.5 to 80 weight % of alkali metal salt ("LiCl ... 0 to 8 wt.%" Page 268 Column 2 Paragraph 2) and that the PAA is diluted to a concentration of 0.1 to 15 weight% ("0.1 ... 2 wt.%" Page 268 Column 2 Paragraph 2) for the benefit of providing appropriate conditions for an alkali metal salt to adjust the morphology of PAA. Although Lee et al. only teach a portion of the claimed ranges, it would have been obvious to one having ordinary skill in the art at the time of the invention to use LiCl and PAA concentrations over the full claimed ranges, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One

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would have been motivated to use LiCl and PAA concentrations over the full claimed ranges for the benefit of providing appropriate conditions for an alkali metal salt to adjust the morphology of PAA.

Lee et al. further teach that pore size and porosity of the PAA are adjusted by controlling a content of alkali metal salt ("When the LiCl content in the solution was raised to 5 wt.%" Page 275 Column 1 Paragraph 1) for the benefit of making the PAA structure more porous with fine pores and, hence, mechanically stronger. While Lee et al. does not disclose any explicit values for pore size or porosity of the PAA, Figure 7 clearly suggests pore sizes on the order of 20 nm to 500 nm and porosity on the order of 0.1% to 30%. Thus the hypothetical combination discloses the claimed invention except for explicit recitation of pore sizes on the order of 20 nm to 500 nm and porosity on the order of 0.1% to 30%. It would have been obvious to one having ordinary skill in the art at the time of the invention to make the pore sizes on the order of 20 nm to 500 nm and porosity on the order of 0.1% to 30%, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to make the pore sizes on the order of 20 nm to 500 nm and porosity on the order of 0.1% to 30% for the benefit of making the PAA structure more porous with fine pores and, hence, mechanically stronger.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to combine Suzuki et al. with Lee et al. for the benefit of providing appropriate conditions for an alkali metal salt to adjust the morphology of PAA

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and then making the PAA structure more porous with fine pores and, hence, mechanically stronger.

Note that while the hypothetical combination does not explicitly teach that the microparticles undergo imidation so that the particle size distribution, pore size, and porosity of the PAA microparticles are maintained, this result is an expected result as evidenced by Asao et al. ("particle morphology of the polyimide microfine particles usually traces back to the morphology of the polyamic acid microfine particles" Column 5 Line 67- Column Line 3) and is not given patentable weight.

10. Regarding Claim 2, Suzuki et al. teach that an organic solvent is used as a good solvent in which the polyamide acid is dissolved ("NMP solution of PAA" Paragraph 2) and that the poor solvent is a mixture of cyclohexane and carbondisulfide (as applied to Claim 1 above).

11. Regarding Claims 5 and 6, Suzuki et al. the weight average molecular weight of the polyamide acid is in the range from 8000 to 220,000 ("Mw=48,000-122,000" Paragraph 3). Thus the hypothetical combination teaches the claimed invention except for polyamide acid having a weight average molecular weight from 8000 to 48,000 and from 122,000 to 220,000. It would have been obvious to one having ordinary skill in the art at the time of the invention to make the polyamide acid have a weight average molecular weight from 8000 to 48,000 and from 122,000 to 220,000, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. One would have been motivated to make the polyamide acid have a weight average molecular weight from 8000 to 48,000 and from 122,000 to 220,000

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for the benefit of amplifying or dampening the effect of varying the concentration of polyamide acid has on the microparticle particle size in order to obtain a desired and/or optimal particle size.

12. Claims 3, 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. ("Aromatic Polyimide Nano-spheres Prepared by Repricitation Method") in view of Lee et al. ("Solution properties of poly(amic acid)-NMP containing LiCL and their effects on membrane morphologies") as applied to Claims 1, 2, and 5, respectively, and in further view of Asao et al. (US 6,187,899).

13. Regarding Claims 3, 4 and 7, the previous combination remains as applied above and teaches the general method as applied above, including that the polyamide acid microparticles have pore size porosity controlled by contents of alkali metal salt (as applied to Claim 1 above).

However, the previous combination does not teach that chemical imidation is completed by adding acetic acid anhydride–pyridine mixed solvent to polyamide acid microparticles by stirring.

In analogous art pertaining to polyimide microparticle production, Asao et al. teach that chemical imidation is completed by adding acetic acid anhydride–pyridine mixed solvent to polyamide acid microparticles by stirring (Column 5 Lines 47-54) for the benefit of allowing the imidation to occur at less than 130°C, which allows for greater options regarding the solvent to be used, allowing for greater economic efficiency as raw material prices fluctuate.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to combine the previous combination with Asao et al. (US 6,187,899) for the benefit of allowing the imidation to occur at less than 130°C, which allows for greater options regarding the solvent to be used, allowing for greater economic efficiency as raw material prices fluctuate.

Response to Arguments

14. Applicant's arguments, see Remarks Page 13 Line 11-20 and the 1.132 affidavit, filed December 4, 2008, with respect to the rejection(s) of claim(s) 1-7 under 35 U.S.C. § 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly-found references Suzuki et al. ("Aromatic Polyimide Nano-spheres Prepared by Repricipitation Method"), Lee et al. ("Solution properties of poly(amic acid)-NMP containing LiCL and their effects on membrane morphologies"), and Asao et al. (US 6,187,899) as applied above.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RYAN OCHYLSKI whose telephone number is 571-270-7009. The examiner can normally be reached on Monday through Thursday and every other Friday from 9:00-6:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Del Sole can be reached on 571-272-1130. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

rmo

/Joseph S. Del Sole/
Supervisory Patent Examiner, Art Unit 1791